



State of Utah

DEPARTMENT OF NATURAL RESOURCES
DIVISION OF OIL, GAS AND MINING

Norman H. Bangerter
Governor

Dee C. Hansen
Executive Director

Dianne R. Nielson, Ph.D.
Division Director

355 West North Temple
3 Triad Center, Suite 350
Salt Lake City, Utah 84180-1203
801-538-5340

DOGM
MINERALS PROGRAM
FILE COPY

March 26, 1990

Mr. Bryan Johnson
Environmental Specialist
Hecla Mining Company
6500 Mineral Drive
Box C-8000
Coeur d'Alene, Idaho 83814-1931

Dear Mr. Johnson:

Re: Tailing Pond Decommissioning and Reclamation, M/021/004, Iron County, Utah

Pursuant to our meeting on Feb. 27, 1990, the Division is in the process of developing more specific reclamation requirements for the tailing pond facility. This letter addresses the Division's present thinking regarding this reclamation.

After review of the tailing pond analyses which you presented to us at the meeting, we have decided that the deleterious nature of the material will require a more comprehensive approach than that initially submitted by Hecla in the September 8, 1989 tailings pond closure proposal. We now feel that it will be necessary to isolate this material as much as possible from the environment. Our intention is to work with Hecla in determining the most economically feasible solution to this problem.

The high levels of heavy metals indicated by the results, suggest the possibility for groundwater or surface water problems, if leachates produced in the pond escape beyond the pond's boundaries. This would be especially true if the pH levels in the pond were to drop below their present levels of 9.5 to 9.8. Concentrations of heavy metals residing in the pond are loosely complexed and would become easily mobilized in a more acid environment. After the leaching solutions have been turned off, the leached material may return to a more neutral pH. This will be especially true if the material is flushed with a fresh water solution before abandonment.

Other problems indicated by the samples originating from the tailing material, are the levels of sodium (Na) and the associated SAR values. SAR values greater than 15 indicate sodic soils. Results from the analyses show SAR values ranging from 35.4 to 113.2. Excess sodium, in the soil profile, affects plant growth by causing a deterioration or dispersion of the soil structure. This deterioration causes restricted water availability to plants. It also restricts aeration, root elongation and seedling development. Sodic soils also affect plant growth by inhibiting nutritional access of calcium and magnesium. High salt content often associated with sodic soils can also have a detrimental effect on plants. However, the EC values indicated in your analyses show a low to medium range for EC (1.2 to 3.7). Values over 4 mmhos/cm are considered an indication of a saline soil.

Because of the necessity to isolate this material we are asking that Hecla change the original, September 8, 1989, proposal of capping the pond with 6 inches of waste rock and 4 inches of topsoil. This proposal would not allow for a sufficient depth of cover to prevent excess moisture from entering the pond, thus allowing for the build up of potentially dangerous leachates over time. The proposed soil depth is also not a sufficient plant growth medium. The proposed depth of cover above the deleterious sodic tailing (10 to 12 inches), would not be adequate to allow healthy plant growth, because plant root growth would be prevented from extending into the tailing.

It is likely that the Division will ask Hecla to implement one of two scenarios:

1. either cap the tailing with a one foot clay cap (as was proposed by Hecla at our February 27, 1990 meeting) and include an additional 3 to 4 feet of topsoil material;
2. construct a 1 to 1.5 foot capillary barrier with the same amount of topsoil over it. The additional depth of topsoil material would be needed to provide an adequate and safe rooting medium for plants.

The capillary barrier would be used to prevent capillary rise or wicking of contaminants above the tailings surface. However, it would not prevent water entering the soil profile from eventually infiltrating into the tailing.

A clay cap compacted to a minimum conductivity of 1×10^{-6} cm/sec, would act to prevent water infiltration into the tailings and vice versa. Two problems may arise in the use of a clay cap: 1. given the nature of the tailing material the clay may be difficult to compact, and 2. a clay cap will act to prevent any natural neutralization of the tailing material over time, effectively encapsulating the tailing. The clay cap option, however, would probably be the most desirable option of the two.

Page 3
Hecla Mining Company
M/021/004
March 26, 1990

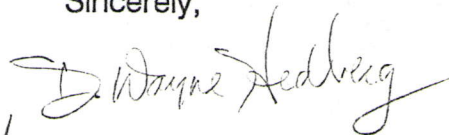
Because of the added expense of borrowing and compaction of the clay material, the Division will consider allowing Hecla to use the capillary barrier option, with the following condition. Hecla must provide evidence that the capillary barrier along with a sufficient depth of topsoil, will be sufficient to keep unacceptable amounts of moisture from reaching the tailing. Because the pond is located in a low precipitation area, it is possible to eliminate water infiltration into the tailing material with an adequate soil cover. Runoff, evapotranspiration, and capillary rise should remove water from the tailing surface in a greater quantity than what is deposited there. A build up of leachate after abandonment of the site is not desirable, and any cover design for the pond must take this into consideration.

It is possible that the tailing themselves could be used as the restrictive barrier. Your March 1, 1990 letter indicates that they have an average permeability of 1.9×10^{-5} cm/sec. Tailing material of a highly dispersed nature, due to sodium, have been used in the past for liners and caps for impoundments. Another advantage to their use is the fact that they don't require compaction.

The Division contacted Mr. Paul Carter of the Bureau of Land Management's Cedar City District, concerning the reclamation of the pond and the new developments regarding the results of the analyses. We were told that developing a barrow area to aid in reclaiming the site would not be out of the question. We have sent the BLM a copy of this letter and the results of the tailing analyses. We have likewise sent copies to the Division of Environmental Health. After review by these agencies we will be able to get back to you with a much more definitive direction concerning the development of the final reclamation plan for the tailing pond. We hope to get back to you with this information by April 15, 1990.

Thank you for your attention and patience as we work out the details.

Sincerely,


for Holland Shepherd
Reclamation Soils Specialist

Attachments

cc: Paul Carter, Cedar City District, BLM
Phil Burns, Bureau of Solid and Hazardous Wastes
Lowell Braxton
Minerals Team

WMN/1-3

A&L MID WEST LABORATORIES, INC.

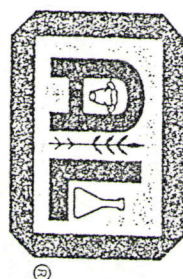
13611 "B" STREET • OMAHA, NE 68144 • (402) 334-7770

REPORT NUMBER 9-180-1551/1555

June 29, 1989 M5

Hecla Mining Company #9595
P. O. Box 310
Enterprise, UT 84725

Subject: Coal & Overburden Analysis
Number of Samples: 5



Laboratory Number	11345	11346	11347	11348	11349
Sample Identification	#1	#2	#3	Top Soil	Waste Pile
pH	9.8	9.5	9.7	8.2	8.3
Total Sulfur (S) %	0.29	0.21	0.33	0.04	0.14
Potential Acidity (Maximum) *	9.1	6.6	10.3	1.3	4.4
Pyritic Sulfur (S) %	0.04	0.02	0.01	0.02	< 0.01
Potential Acidity (Actual) *	1.2	< 1.0	< 1.0	< 1.0	< 1.0
Neutralization Potential *	163	151	157	58	116
Acid-Base Potential					
CaCO ₃ Excess * (+)	162	151	157	88	116
CaCO ₃ Deficiency * (-)					
Potentially Acid/Toxic**	No	No	No	No	No
Other:					
Water Soluble Calcium (Ca) ppm	9	17	14	64	150
Water Soluble Magnesium (Mg) ppm	1	2	1	10	19
Water Soluble Sodium (Na) ppm	420	1830	1630	51	53
Sodium Absorption Ratio (SAR)	35.4	111.8	113.2	1.6	1.1
Sulfate Sulfur SO ₄ -S (%)	0.07	0.06	0.10	0.01	0.08

*
**

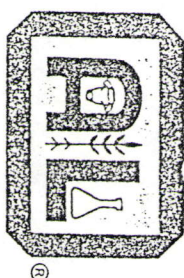
Tons CaCO₃ equivalent per 1,000 tons of material.
pH less than 4.0 or acid-base potential deficiency greater than 5.0 tons
CaCO₃ equivalent per 1,000 tons of material. Indicate yes or no
< Less than

Dedicated Exclusively to Providing Quality Analytical Services

John Torpy
John Torpy, Laboratory Supervisor

Our reports and letters are for the exclusive and confidential use of our clients and may not be reproduced in whole or in part, nor may any reference be made to the work, the results, or the company in any advertising, news release, or other public announcements without obtaining our prior written authorization.

A&L MID WEST LABORATORIES, INC.
 13611 "B" STREET • OMAHA, NE 68144 • (402) 334-7770



REPORT NUMBER: 9-180-1551

June 29, 1989 (m5)

SUBJECT: ENVIRONMENTAL ANALYSIS

Hecla Mining Company #9595
 Box 310
 Enterprise, UT 84725

PO#: EM44288
 Date Received: 6-15-89

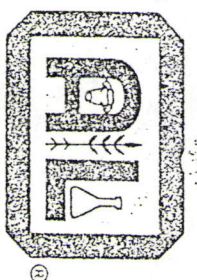
Laboratory Number	Sample Identification	Analysis	Level Found	Detection Limit	Method
11345	#1	Total Cyanide	36.20 mg/kg	0.2 mg/kg	EPA 9010
		Total Aluminum	12,787 mg/kg	1.00 mg/kg	EPA 6010
		Total Arsenic	139 mg/kg	5.00 mg/kg	EPA 6010
		Total Barium	10,087 mg/kg	0.5 mg/kg	EPA 6010
		Total Cadmium	264 mg/kg	0.5 mg/kg	EPA 6010
		Total Chromium	229 mg/kg	1.00 mg/kg	EPA 6010
		Total Copper	413 mg/kg	1.00 mg/kg	EPA 6010
		Total Iron	15,057 mg/kg	1.00 mg/kg	EPA 6010
		Total Lead	3499 mg/kg	5.00 mg/kg	EPA 6010
		Total Manganese	1783 mg/kg	1.00 mg/kg	EPA 6010
		Total Mercury	0.40 mg/kg	0.02 mg/kg	EPA 7471
		Total Molybdenum	< 1.00 mg/kg	1.00 mg/kg	EPA 6010
		Total Nickel	10.9 mg/kg	1.00 mg/kg	EPA 6010
		Total Silver	23.3 mg/kg	1.00 mg/kg	EPA 6010
		Total Titanium	975 mg/kg	100 mg/kg	Flame AA
		Total Zinc	5503 mg/kg	1.00 mg/kg	EPA 6010
		Total Solids	87.2%	0.01%	SM 209F
		*Extractable Selenium by AB-DTPA	< 0.05 mg/kg	0.05 mg/kg	SM 303E

Note: < = Less than

Respectfully submitted,

John Torpy
 John Torpy
 Laboratory Supervisor
 Dedicated Exclusively to Providing Quality Analytical Services

Our reports and letters are for the exclusive and confidential use of our clients and may not be reproduced in whole or in part, nor may any reference be made to the work, the results, or the company in any advertising, news release, or other public announcements without obtaining our prior written authorization.



A&L MID WEST LABORATORIES, INC.
13611 "B" STREET • OMAHA, NE 68144 • (402) 334-7770

REPORT NUMBER: 9-180-1552

June 29, 1989 (m5)

SUBJECT: ENVIRONMENTAL ANALYSIS

Hecla Mining Company #9595
Box 310
Enterprise, UT 84725

PO#: EM44288
Date Received: 6-15-89

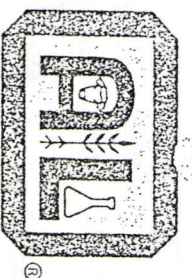
Laboratory Number	Sample Identification	Analysis	Level Found	Detection Limit	Method
11346	#2	Total Cyanide Total Aluminum Total Arsenic Total Barium Total Cadmium Total Chromium Total Copper Total Iron Total Lead Total Manganese Total Mercury Total Molybdenum Total Nickel Total Silver Total Titanium Total Zinc Total Solids *Extractable Selenium by AB-DTPA	116.9 mg/kg 15,148 mg/kg 288 mg/kg 6,907 mg/kg 40.7 mg/kg 17.2 mg/kg 623 mg/kg 12,273 mg/kg 6,425 mg/kg 1,466 mg/kg 0.39 mg/kg < 1.00 mg/kg 560 mg/kg 61.9 mg/kg 759 mg/kg 8,132 mg/kg 88.3% < 0.05 mg/kg	0.2 mg/kg 1.00 mg/kg 5.00 mg/kg 0.5 mg/kg 0.5 mg/kg 1.00 mg/kg 1.00 mg/kg 1.00 mg/kg 5.00 mg/kg 1.00 mg/kg 0.02 mg/kg 1.00 mg/kg 1.00 mg/kg 1.00 mg/kg 100 mg/kg 1.00 mg/kg 0.01% 0.05 mg/kg	EPA 9010 EPA 6010 EPA 6010 EPA 6010 EPA 6010 EPA 6010 EPA 6010 EPA 6010 EPA 6010 EPA 6010 EPA 7471 EPA 6010 EPA 6010 EPA 6010 Flame AA EPA 6010 SM 209F SM 303E

Note: < = Less than

Respectfully submitted,


John Torpy
Laboratory Supervisor
Dedicated Exclusively to Providing Quality Analytical Services

Our reports and letters are for the exclusive and confidential use of our clients and may not be reproduced in whole or in part, nor may any reference be made to the work, the results, or the company in any advertising, news release, or other public announcements without obtaining our prior written authorization.



A&L MID WEST LABORATORIES, INC.
13611 "B" STREET • OMAHA, NE 68144 • (402) 334-7770

REPORT NUMBER: 9-180-1553
(Corrected Report 7-26-89)

June 29, 1989 (m5)

SUBJECT: ENVIRONMENTAL ANALYSIS

Hecla Mining Company #9595
Box 310
Enterprise, UT 84725

PO#: EM44288
Date Received: 6-15-89

Laboratory Number	Sample Identification	Analysis	Level Found	Detection Limit	Method
11347	#3	Total Cyanide	83.9 mg/kg	0.2 mg/kg	EPA 9010
		Total Aluminum	11,849 mg/kg	1.00 mg/kg	EPA 6010
		Total Arsenic	169 mg/kg	5.00 mg/kg	EPA 6010
		Total Barium	6,709 mg/kg	0.5 mg/kg	EPA 6010
		Total Cadmium	32.4 mg/kg	0.5 mg/kg	EPA 6010
		Total Chromium	15.4 mg/kg	1.00 mg/kg	EPA 6010
		Total Copper	593 mg/kg	1.00 mg/kg	EPA 6010
		Total Iron	9,942 mg/kg	1.00 mg/kg	EPA 6010
		Total Lead	5,150 mg/kg	5.00 mg/kg	EPA 6010
		Total Manganese	2,185 mg/kg	1.00 mg/kg	EPA 6010
		Total Mercury	0.40 mg/kg	0.02 mg/kg	EPA 7471
		Total Molybdenum	< 1.00 mg/kg	1.00 mg/kg	EPA 6010
		Total Nickel	4,74 mg/kg	1.00 mg/kg	EPA 6010
		Total Silver	10.7 mg/kg	1.00 mg/kg	EPA 6010
		Total Titanium	556 mg/kg	100 mg/kg	Flame AA
		Total Zinc	6,934 mg/kg	1.00 mg/kg	EPA 6010
		Total Solids	86.3%	0.01%	SM 209F
		* Extractable Selenium by AB-DTPA	< 0.05 mg/kg	0.05 mg/kg	SM 303E

Note: < = Less than

Respectfully submitted,

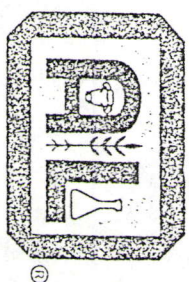
John Torpy

Laboratory Supervisor
Dedicated Exclusively to Providing Quality Analytical Services

Our reports and letters are for the exclusive and confidential use of our clients and may not be reproduced in whole or in part, nor may any reference be made to the work, the results, or the company in any advertising, news release, or other public announcements without obtaining our prior written authorization.

A&L MID WEST LABORATORIES, INC.

13611 "B" STREET • OMAHA, NE 68144 • (402) 334-7770



REPORT NUMBER: 9-180-1554
(Corrected Report 7-27-89)

June 29, 1989 (m5)

SUBJECT: ENVIRONMENTAL ANALYSIS

Hecla Mining Company #9595
Box 310
Enterprise, UT 84725

PO#: EM44288
Date Received: 6-15-89

Laboratory Number	Sample Identification	Analysis	Level Found	Detection Limit	Method
11348	Top Soil	Total Cyanide Total Aluminum Total Arsenic Total Barium Total Cadmium Total Chromium Total Copper Total Iron Total Lead Total Manganese Total Mercury Total Molybdenum Total Nickel Total Silver Total Titanium Total Zinc Total Solids Extractable Selenium by AB-DTPA	< 0.2 mg/kg 18,724 mg/kg < 5.00 mg/kg 244 mg/kg < 0.5 mg/kg 15.2 mg/kg < 1.00 mg/kg 16,418 mg/kg < 5.00 mg/kg 634 mg/kg 0.06 mg/kg < 1.00 mg/kg 12.0 mg/kg < 1.00 mg/kg 1,650 mg/kg 76.1 mg/kg 97.7% 0.09 mg/kg	0.2 mg/kg 1.00 mg/kg 5.00 mg/kg 0.5 mg/kg 0.5 mg/kg 1.00 mg/kg 1.00 mg/kg 1.00 mg/kg 5.00 mg/kg 1.00 mg/kg 0.02 mg/kg 1.00 mg/kg 1.00 mg/kg 1.00 mg/kg 100 mg/kg 1.00 mg/kg 0.01% 0.05 mg/kg	EPA 9010 EPA 6010 EPA 6010 EPA 6010 EPA 6010 EPA 6010 EPA 6010 EPA 6010 EPA 6010 EPA 6010 EPA 7471 EPA 6010 EPA 6010 EPA 6010 Flame AA EPA 6010 SM 209F SM 303E

Note: < = Less than

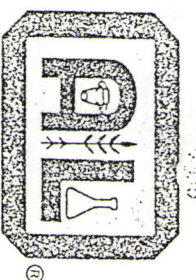
Respectfully submitted,

John Torpy
John Torpy
Laboratory Supervisor
Dedicated Exclusively to Providing Quality Analytical Services

Our reports and letters are for the exclusive and confidential use of our clients and may not be reproduced in whole or in part, nor may any reference be made to the work, the results, or the company in any advertising, news release, or other public announcements without obtaining our prior written authorization.

A&L MID WEST LABORATORIES, INC.

13611 "B" STREET • OMAHA, NE 68144 • (402) 334-7770



REPORT NUMBER: 9-180-1555

June 29, 1989 (m5)

SUBJECT: ENVIRONMENTAL ANALYSIS

Hecla Mining Company #9595
Box 310
Enterprise, UT 84725

PO#: EM44288
Date Received: 6-15-89

Laboratory Number	Sample Identification	Analysis	Level Found	Detection Limit	Method
11349	Waste Pile	Total Cyanide Total Aluminum Total Arsenic Total Barium Total Cadmium Total Chromium Total Copper Total Iron Total Lead Total Manganese Total Mercury Total Molybdenum Total Nickel Total Silver Total Titanium Total Zinc Total Solids Extractable Selenium by AB-DTPA	< 0.2 mg/kg 12,970 mg/kg 179 mg/kg 1,404 mg/kg 20.8 mg/kg 3.36 mg/kg 233 mg/kg 986 mg/kg 2,754 mg/kg 1,162 mg/kg 0.18 mg/kg < 1.00 mg/kg 5.16 mg/kg 19.6 mg/kg 468 mg/kg 2,905 mg/kg 99.8% 0.08 mg/kg	0.2 mg/kg 1.00 mg/kg 5.00 mg/kg 0.5 mg/kg 0.5 mg/kg 1.00 mg/kg 1.00 mg/kg 1.00 mg/kg 5.00 mg/kg 1.00 mg/kg 0.02 mg/kg 1.00 mg/kg 1.00 mg/kg 1.00 mg/kg 100 mg/kg 1.00 mg/kg 0.01% 0.05 mg/kg	EPA 9010 EPA 6010 EPA 6010 EPA 6010 EPA 6010 EPA 6010 EPA 6010 EPA 6010 EPA 6010 EPA 6010 EPA 7471 EPA 6010 EPA 6010 EPA 6010 Flame AA EPA 6010 SM 209F SM 303E

Note: < = Less than

Respectfully submitted,

John Torpy
John Torpy
Laboratory Supervisor
Dedicated Exclusively to Providing Quality Analytical Services

Our reports and letters are for the exclusive and confidential use of our clients and may not be reproduced in whole or in part, nor may any reference be made to the work, the results, or the company in any advertising, news release, or other public announcements without obtaining our prior written authorization.

REPORT NUMBER

174-0116

REPORT DATE

6/29/89

ACCOUNT NO.

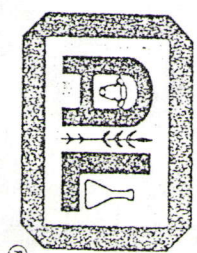
9595

GROWER

HECIA MINING COMPANY

13611 "B" Street • Omaha, Nebraska 68144-3693 • Phone: (402) 334-7770

A & L MID WEST LABORATORIES, INC.



TO: HECIA MINING COMPANY
TANNY HARLIN
BOX 310
ENTERPRISE UT 84725

SUBMITTED BY:

SOIL ANALYSIS REPORT

(SEE EXPLANATION ON BACK) INFO SHEET # 127797

SAMPLE NUMBER	LAB NUMBER	ORGANIC MATTER PERCENT	RATE	P ₁ (WEAK GRAY) ppm	P ₂ (STRONG GRAY) ppm	BICARBONATE P ppm	POTASSIUM K ppm	MAGNESIUM Mg ppm	CALCIUM Ca ppm	SODIUM Na ppm	SOIL pH	BUFFER INDEX	HYDROGEN GEN meq/100g	CATION EXCHANGE CAPACITY C.E.C. meq/100g	PERCENT BASE SATURATION (COMPUTED)				
															% K	% Mg	% Ca	% H	% Na
	34254	0.3VL	39	1VL	2VL		155VH	20VL	1425H	316VH	9.8		0.0	9.1	4.4	1.8	78.6	0.015	2
	34295	0.3VL	39	2VL	3VL		238VH	17VL	1400M	994VH	9.5		0.0	12.1	5.1	1.2	58.0	0.035	6
	34296	0.3VL	39	1VL	2VL		246VH	20VL	1412M	659VH	9.7		0.0	11.6	5.4	1.4	60.9	0.032	2
	34297	2.1M	71	21H	79VH		481VH	366VH	2801H	36	8.2		0.0	18.5	6.7	16.6	75.9	0.0	0.8

DTPA EXTRACTION

SAMPLE NUMBER	NITRATE NO ₃ -N ppm	SULFUR S ppm	ZINC Zn ppm	MANGANESE Mn ppm	IRON Fe ppm	COPPER Cu ppm	BORON B ppm	EXCESS LIME RATE	SOLUBLE SALTS mmol/L	SAND %	SILT %	CLAY %	SOIL TYPE
2VL	2VL	2VL	2VL	2VL	2VL	2VL	2VL	2VL	2VL	14	78	8	SILT LOAM
2VL	2VL	2VL	2VL	2VL	2VL	2VL	2VL	2VL	2VL	10	84	6	SILT
2VL	2VL	2VL	2VL	2VL	2VL	2VL	2VL	2VL	2VL	10	82	8	SILT
2VL	2VL	2VL	2VL	2VL	2VL	2VL	2VL	2VL	2VL	38	46	16	LOAM

COMMENTS:

The sample identified as waste pile consisted entirely of particle sizes of cobbles and coarse gravel. This material was pulverized and analyzed for the parameters requiring total element content. It was not analyzed for extractable or exchangeable nutrients.

This report applies only to the sample(s) tested. Samples are retained a maximum of thirty days after testing.

A & L MID WEST LABORATORIES, INC.
Ken Feldman/John Mendenhall
AL Rev 5.1 MS

(801) 439-5355 Zone 5

DOE TO RANGE: VERY LOW (VL), LOW (L), MEDIUM (M), HIGH (H), VERY HIGH (VH), AND NONE (N)
N - ESTIMATED NITROGEN RELEASE
MULTIPLY THE RESULTS IN ppm BY 2 TO CONVERT TO LBS. PER ACRE OF THE ELEMENTAL FORM

MULTIPLY THE RESULTS IN ppm BY 4.6 TO CONVERT TO LBS. PER ACRE P₂O₅
MULTIPLY THE RESULTS IN ppm BY 2.4 TO CONVERT TO LBS. PER ACRE K₂O
MOST SOILS WEIGH TWO (2) MILLION POUNDS (ONLY WEIGHT) FOR AN ACRE OF SOIL 82.3 INCHES DEEP.